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Conference Abstract

Announcing Big-Bee: An initiative to promote understanding of bees through image and trait digitization

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Abstract

While bees are critical to sustaining a large proportion of global food production, as well as pollinating both wild and cultivated plants, they are decreasing in both numbers and diversity. Our understanding of the factors driving these declines is limited, in part, because we lack sufficient data on the distribution of bee species to predict changes in their geographic range under climate change scenarios. Additionally lacking is adequate data on the behavioral and anatomical traits that may make bees either vulnerable or resilient to human-induced environmental changes, such as habitat loss and climate change. Fortunately, a wealth of associated attributes can be extracted from the specimens deposited in natural history collections for over 100 years.

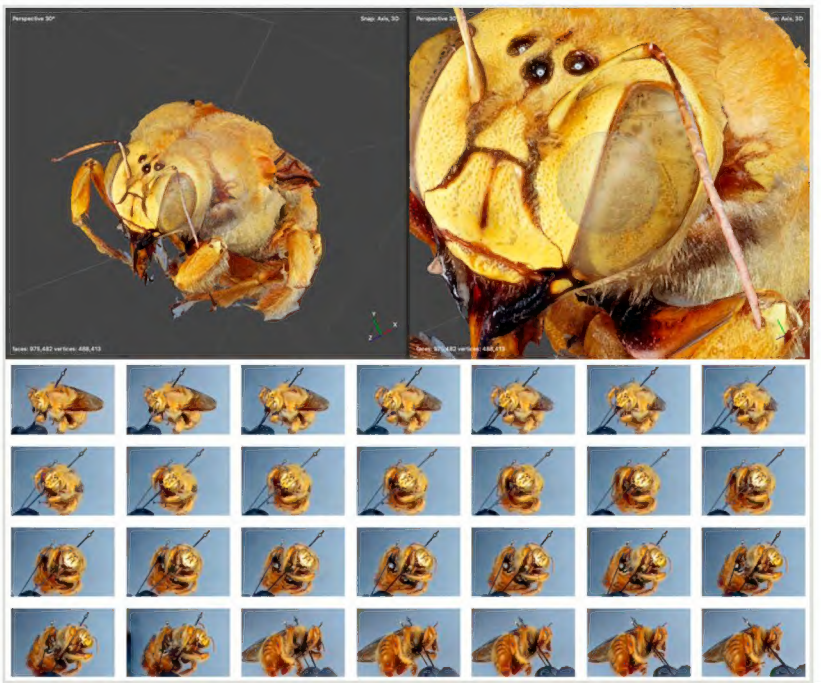

Figure 1.

2D and 3D images from the Big-Bee project will be available for novel exploration in bee traits, 3D modeling, and computer vision research. In this figure, two representations of a 3D model are shown with a dark grey background. This model is generated from 64 focal stacked 2D images taken at different angles. A subset of those 2D images is pictured here with a light blue background. Both 3D models and the 2D images used to create the models will be shared by the project.

Extending Anthophila Research Through Image and Trait Digitization (Big-Bee) is a newly funded US National Science Foundation Advancing Digitization of Biodiversity Collections project. Over the course of three years, we will create over one million high-resolution 2D and 3D images of bee specimens (Fig. 1), representing over 5,000 worldwide bee species, including most of the major pollinating species. We will also develop tools to measure bee traits from images and generate comprehensive bee trait and image datasets to measure changes through time. The Big-Bee network of participating institutions includes 13 US institutions (Fig. 2) and partnerships with US government agencies. We will develop novel mechanisms for sharing image datasets and datasets of bee traits that will be available through an open, Symbiota-Light (Gilbert et al. 2020) data portal called the Bee Library. In addition, biotic interaction and species association data will be shared via Global Biotic

Interactions (Poelen et al. 2014). The Big-Bee project will engage the public in research through community science via crowdsourcing trait measurements and data transcription from images using Notes from Nature (Hill et al. 2012). Training and professional development for natural history collection staff, researchers, and university students in data science will be provided through the creation and implementation of workshops focusing on bee traits and species identification. We are also planning a short, artistic college radio segment called "the Buzz" to get people excited about bees, biodiversity, and the wonders of our natural world.

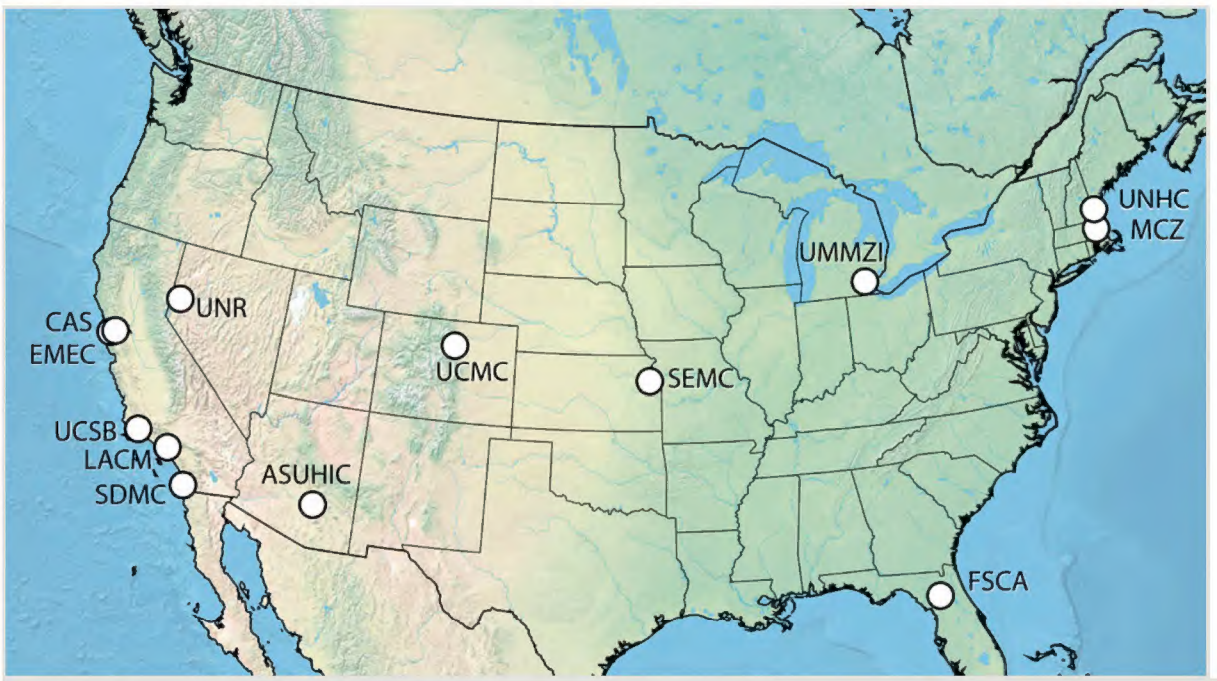

Figure 2.

Institutions participating in the Big-Bee project.

Keywords

Anthophila, natural history collections, specimens, museum

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